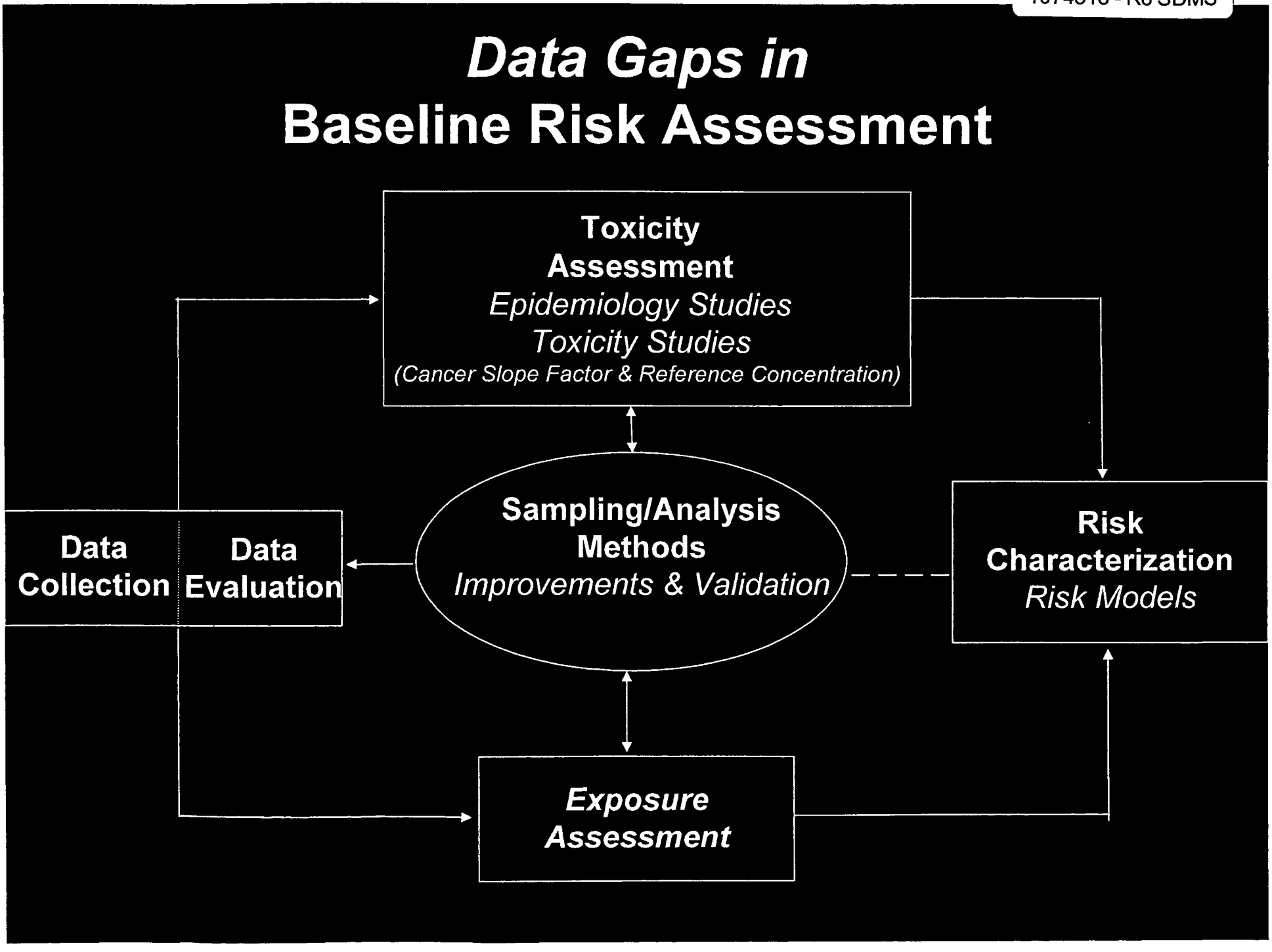
Data Gaps in Baseline Risk Assessment



Prioritized Data Gaps at the Libby Superfund Site for Human Health Risk Assessment

- **Existing exposure data for human receptors at the Site are inadequate.**

    A. Data are insufficient to identify and quantify direct and/or indirect exposure pathways in the residential area, as well as cumulative exposure (see Conceptual Site Model).
        a. Outdoor ambient air
        b. Indoor air
        c. Active disturbance of contaminated soils and other materials (activity-based sampling)
        d. Transportation corridors (e.g., highways, railways)
        e. Others (e.g., outdoor surfaces)

    B. Data are insufficient to monitor and/or evaluate whether current EPA cleanup actions are fully protective.
        a. Activity-based sampling
        b. Representative indoor and outdoor scenarios

- **The epidemiology of asbestos-related disease in Libby residents is insufficiently characterized.**

    A. Improved understanding of the relationship between low-level, long-term exposures and development of disease (respiratory and systemic) is needed (Structural Equation Modeling).
        a. Biopersistence and pre-existing lung burden should be considered.

    B. Clinical observations suggest that disease in Libby residents is different from what is reported in other asbestos-exposed populations.

    C. Quantification of Libby Amphibole in human lung tissues will help understand future health risks for residents with pre-existing lung burdens.

    D. Longitudinal medical surveillance is necessary to help evaluate the efficacy of cleanup actions.

- **Aspects of sample collection and analysis methods for Libby Amphibole require further validation and improvement.**

    A. Analytical sensitivities low enough for risk characterization are critical.
        a. Problem
            i. Analytical counting rules rather than toxicological impacts generally drive what is identified/counted.
            ii. The current paradigm is high in analytical cost and is analyst time-intensive.
        b. New approach. Improved understanding of the relationship between morphology and toxicity will allow an appropriate strategy for analytical method development.

B. Evaluation of sample filter efficiency for collection of Libby Amphibole is critical to ensure data accuracy.
    a. Filter pore size - 0.8 μm and 0.45 μm
    b. Filter composition - mixed cellulose ester (MCE) and polycarbonate (PC) filter material

C. How do analytical preparation techniques affect data interpretation?
    a. Direct and indirect sample preparation

D. An analytical tool is needed to measure the presence/absence of Libby Amphibole in soil at levels less than ~0.05% (by weight).
    a. Validation of the glove box method for Libby Amphibole – *Standard Operating Procedures for Sampling Airborne Asbestos Fiber in a Laboratory Enclosure – Qualitative Procedure. SOP # EPA Region 10-IEU-001 (Januch 2005).*
    b. Development or refinement of other techniques that isolate/concentrate Libby Amphibole while minimizing matrix effects

E. Validation of outdoor ambient air sample collection techniques is critical.
    a. Low flow rates paired with multi-day, continuous sampling

F. Validation of dust-fall sample collection efficiency adds value to our understanding of potential environmental contamination associated with building demolitions.

- **Characterization of the toxicity of Libby Amphibole is inadequate.**

A. Cancer Slope Factor (CSF)
    a. The existing IRIS value is not appropriate because it
        i. is based mainly on chrysotile exposures in workers
        ii. does not specifically account for increased cancer potency of amphiboles
        iii. does not account for toxicity of short, thin fibers.
    b. A quantitative cancer slope factor specific for the respirable fraction of Libby Amphibole represents critical data for the Libby human health risk assessment.
    c. Comparative fiber toxicity/cancer potency data provides added value for addressing other forms of asbestos in different Regions.
    d. Specific toxicity data on subfractions of the respirable portion of Libby Amphibole provide added value for understanding the potency of short/thin fibers. These data become critically important if comparative mineralogical data are considered for toxicity assessment and analytical methodology development.
    e. Animal toxicity studies evaluating multiple durations of exposure (less than lifetime exposures) with lifetime follow-up are critical for understanding the combined effects of concentration and exposure duration on toxicity, thus enabling accurate characterization of human health risks at the Libby Site.
        i. Do high-dose short-term exposures and low-dose long-term exposures result in comparable toxicity?

B. Reference Concentration (RfC)
    a. No RfC for asbestos is currently available.
    b. Region 8 is in the process of developing a Libby-specific provisional RfC for fibrotic lung changes based on historical worker cohort data (to be presented later).
    c. Are there other endpoints that are candidates for the critical effect?

C. Systemic Effects
    a. Animal toxicity studies provide critical data that may avoid the need for an uncertainty factor for database limitations in the RfC.
        i. Immune-mediated disease (e.g., lupus, scleroderma, rheumatoid arthritis)
        ii. Chronic inflammation
        iii. Developmental and reproductive effects

D. Target Tissue Dosimetry
    a. Animal toxicity studies (that ideally consider both inhalation and oral routes of exposure) can provide critical quantitative data on target tissue burdens of Libby Amphibole to inform the need for additional laboratory animal studies for complete hazard identification.
    b. Knowledge of the behavior of Libby Amphibole in target tissues can improve understanding of the relationship between administered dose and target tissue dosimetry.
        i. Breakage/dissolution
        ii. Clearance
        iii. Translocation between tissues
        iv. Biopersistence

E. The Interim OSWER Model holds promise but should undergo extensive peer review and validation in order to be considered for use at the Libby Site.
    a. Concerns about the model arise from uncertainties associated with the use of
        i. Historical epidemiological data
        ii. Historical data for dose reconstruction
        iii. Assumptions regarding reconstruction of fiber size distributions for the epidemiological studies.

Region 8's Proposed Objectives for Animal Toxicity Studies for the Libby Site:

1) Generate reliable data to facilitate complete hazard identification for non-cancer endpoints. The RfC being developed uses data on radiological lung abnormalities as the critical effect. Epidemiological data from the Libby residents raise questions about other potential effects on the immune system. Therefore, laboratory animal studies are necessary to determine whether these immune effects are part of the mode of action for lung abnormalities or if they are a different toxicological endpoint with a different dose-response relationship. In addition the current database lacks information on reproductive and developmental effects. Animal toxicity studies will fill in this data gap. Alternatively, target tissue dosimetry studies in animals will help inform the need for conventional animal toxicity studies.
2) Generate reliable dose-response data for cancer effects in animals exposed by inhalation (and ideally also ingestion) to Libby Amphibole. The existing IRIS CSF is not appropriate because, it:
    a. is based mainly on chrysotile exposures in workers,
    b. does not specifically account for increased cancer potency of amphiboles, and
    c. does not account for the toxicity of short/thin fibers.